Name:

at1117paper: Complete the Square (v305)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 48 feet. Their combined area, found by adding the square's area and the rectangle's area, is 945 square feet. What is the value of x?

Example's Solution

$$x^2 + 48x = 945$$

To complete the square, add $\left(\frac{48}{2}\right)^2 = 576$ to both sides.

$$x^2 + 48x + 576 = 1521$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 24)^2 = 1521$$

Undo the squaring.

$$x + 24 = \pm\sqrt{1521}$$

$$x + 24 = \pm 39$$

Subtract 24 from both sides.

$$x = -24 \pm 39$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 15$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 50 feet. The total area, of the square and rectangle, is 531 square feet. What is the value of x?

$$x^2 + 50x = 531$$

$$x^2 + 50x + 625 = 1156$$

$$(x + 25)^2 = 1156$$

$$x + 25 = \pm 34$$

$$x = 9$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 46 feet. The total area, of the square and rectangle, is 1235 square feet. What is the value of x?

$$x^2 + 46x = 1235$$
$$x^2 + 46x + 529 = 1764$$
$$(x + 23)^2 = 1764$$
$$x + 23 = \pm 42$$
$$x = 19$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 42 feet. The total area, of the square and rectangle, is 343 square feet. What is the value of x?

$$x^2 + 42x = 343$$
$$x^2 + 42x + 441 = 784$$
$$(x + 21)^2 = 784$$
$$x + 21 = \pm 28$$
$$x = 7$$